

FIG. 1

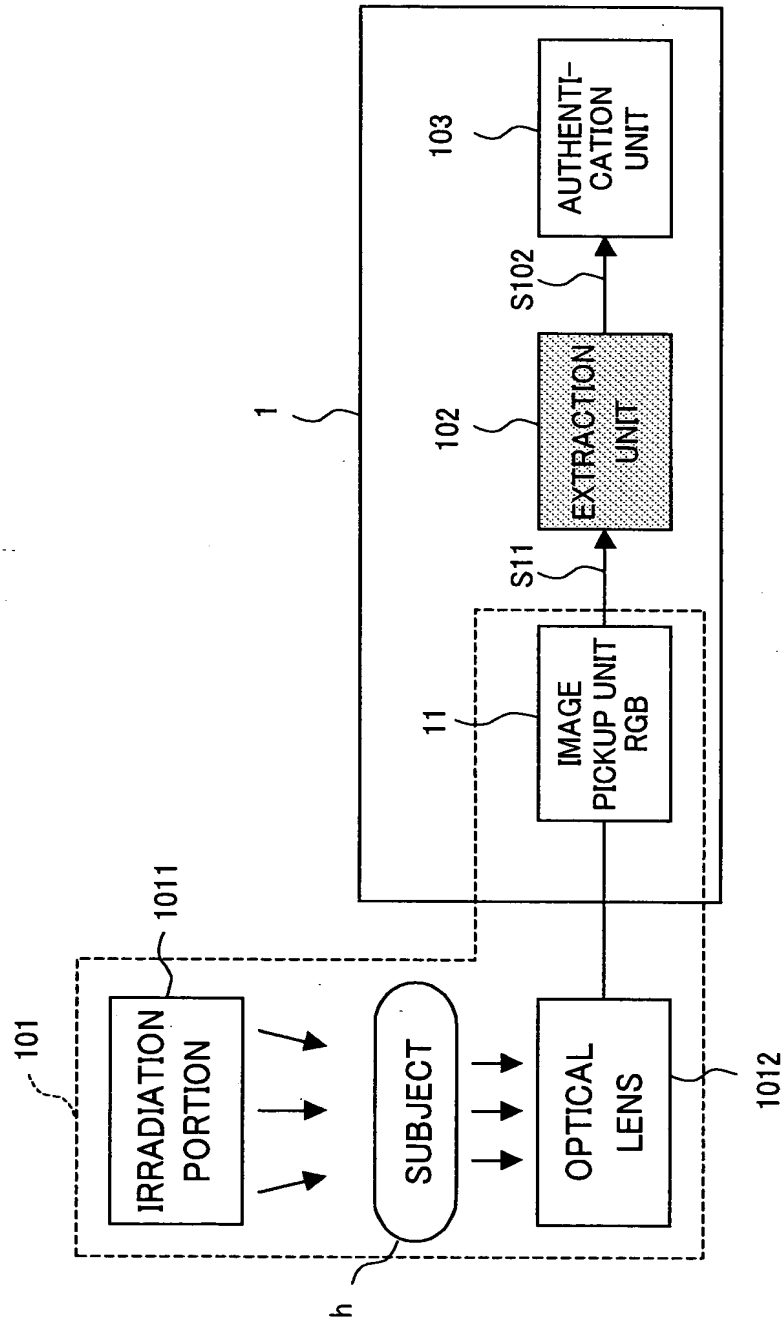


FIG. 2

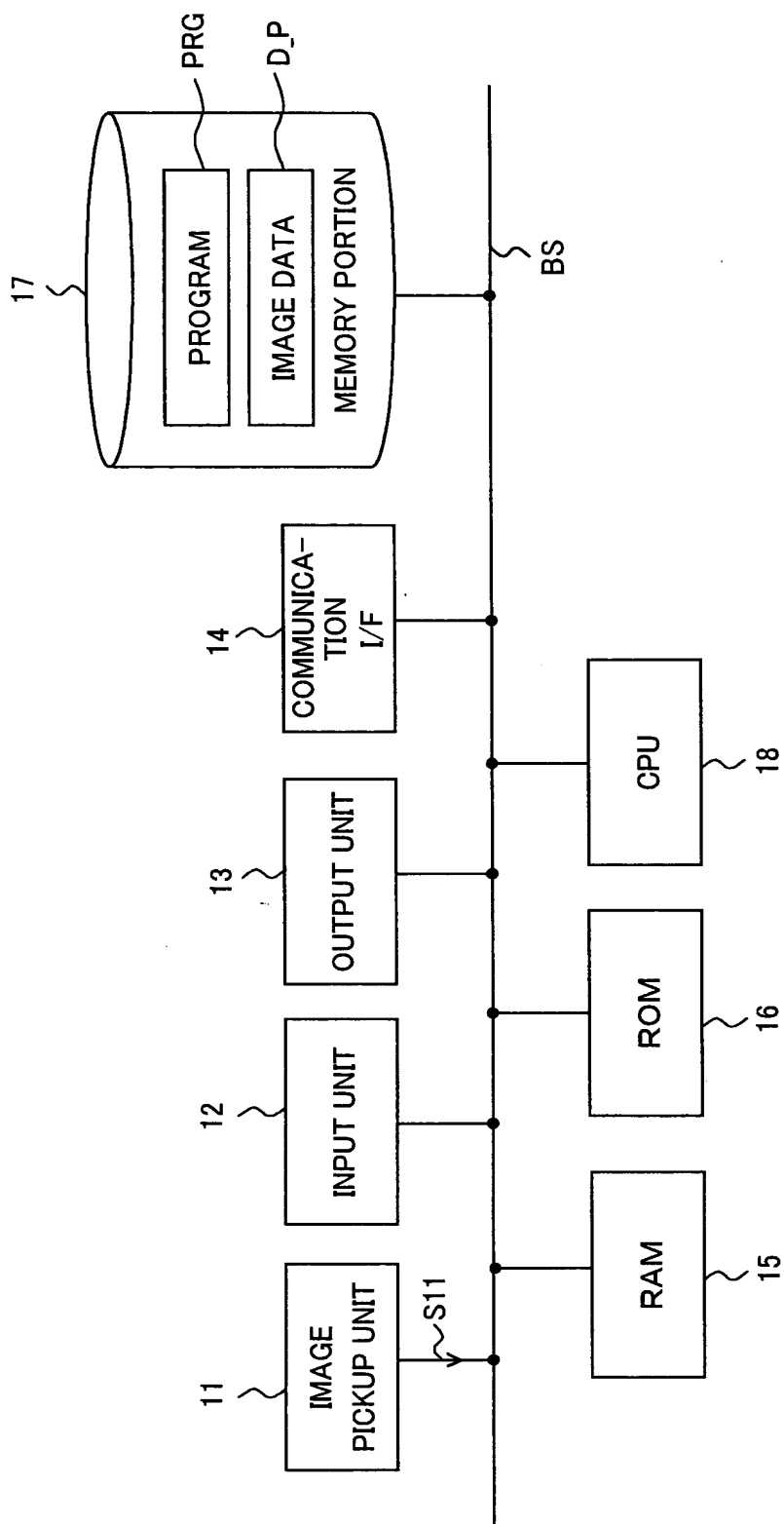


FIG. 3

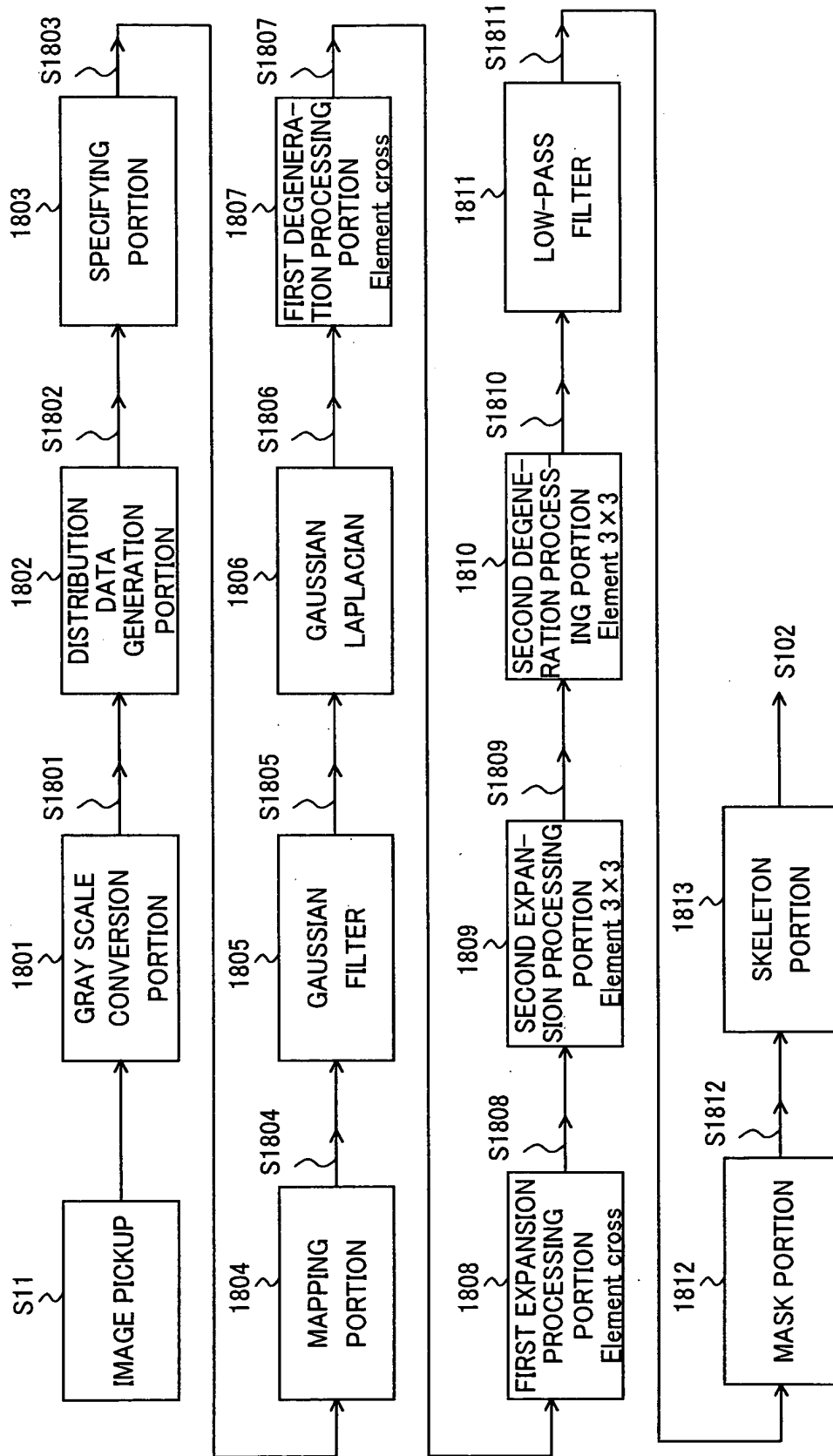


FIG. 4A

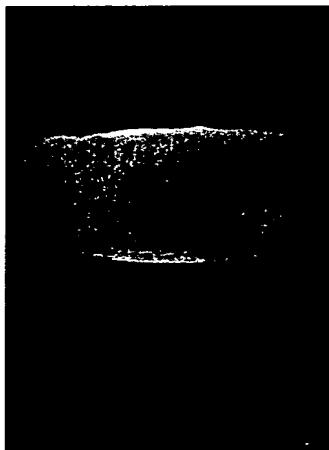


FIG. 4B

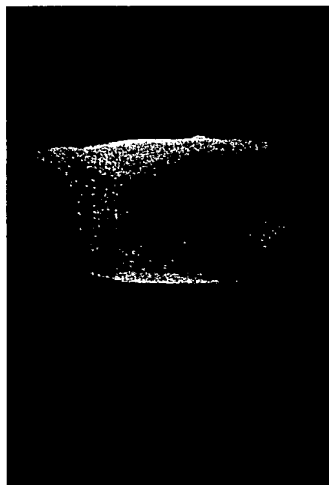


FIG. 4C

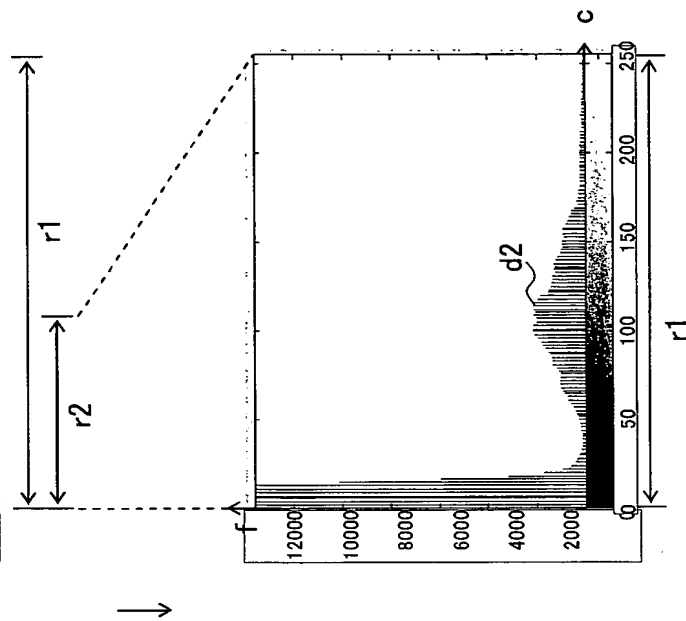
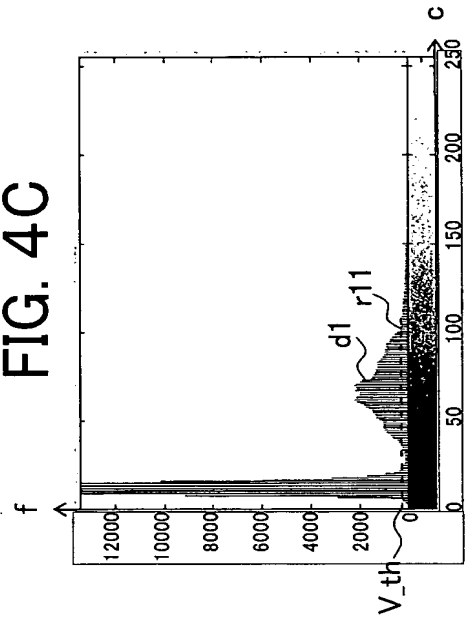


FIG. 4E

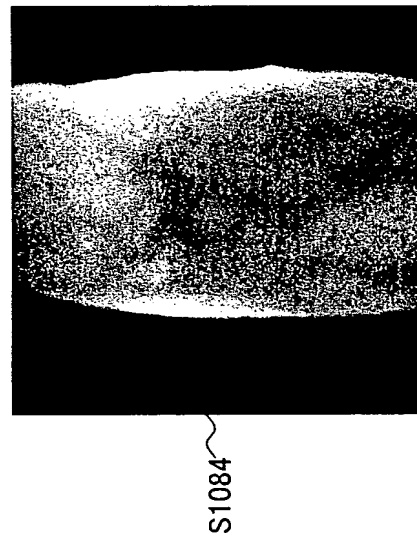


FIG. 5B

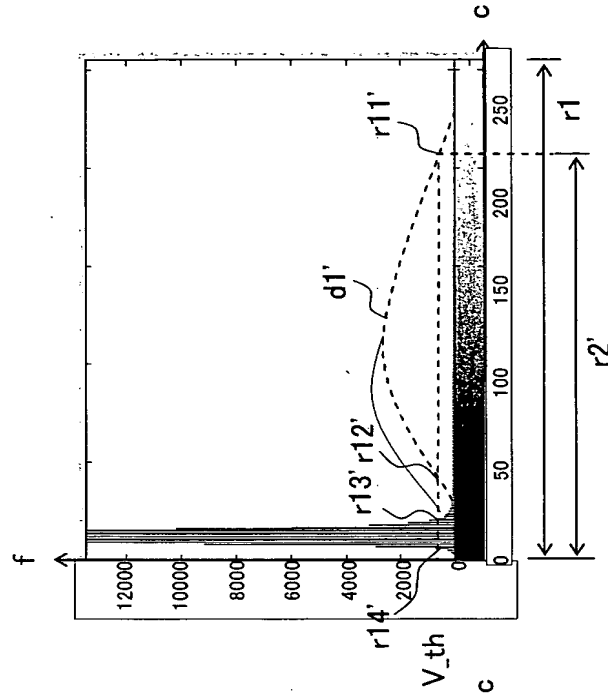


FIG. 5A

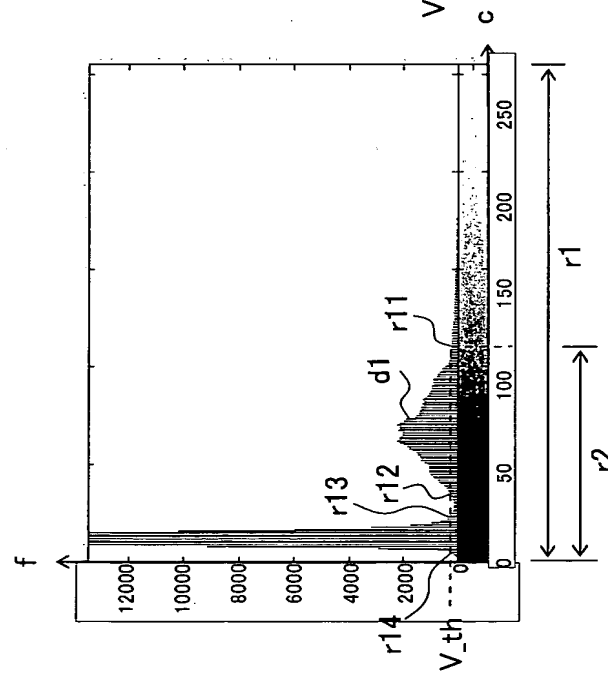


FIG. 6

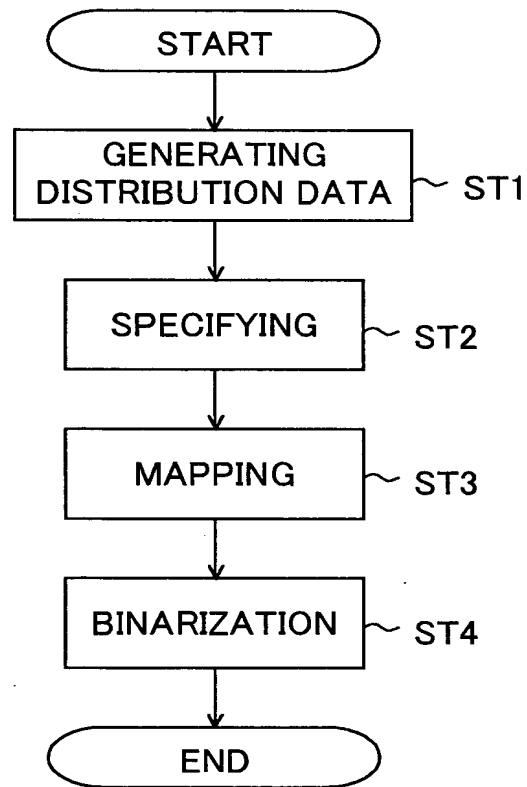


FIG. 7

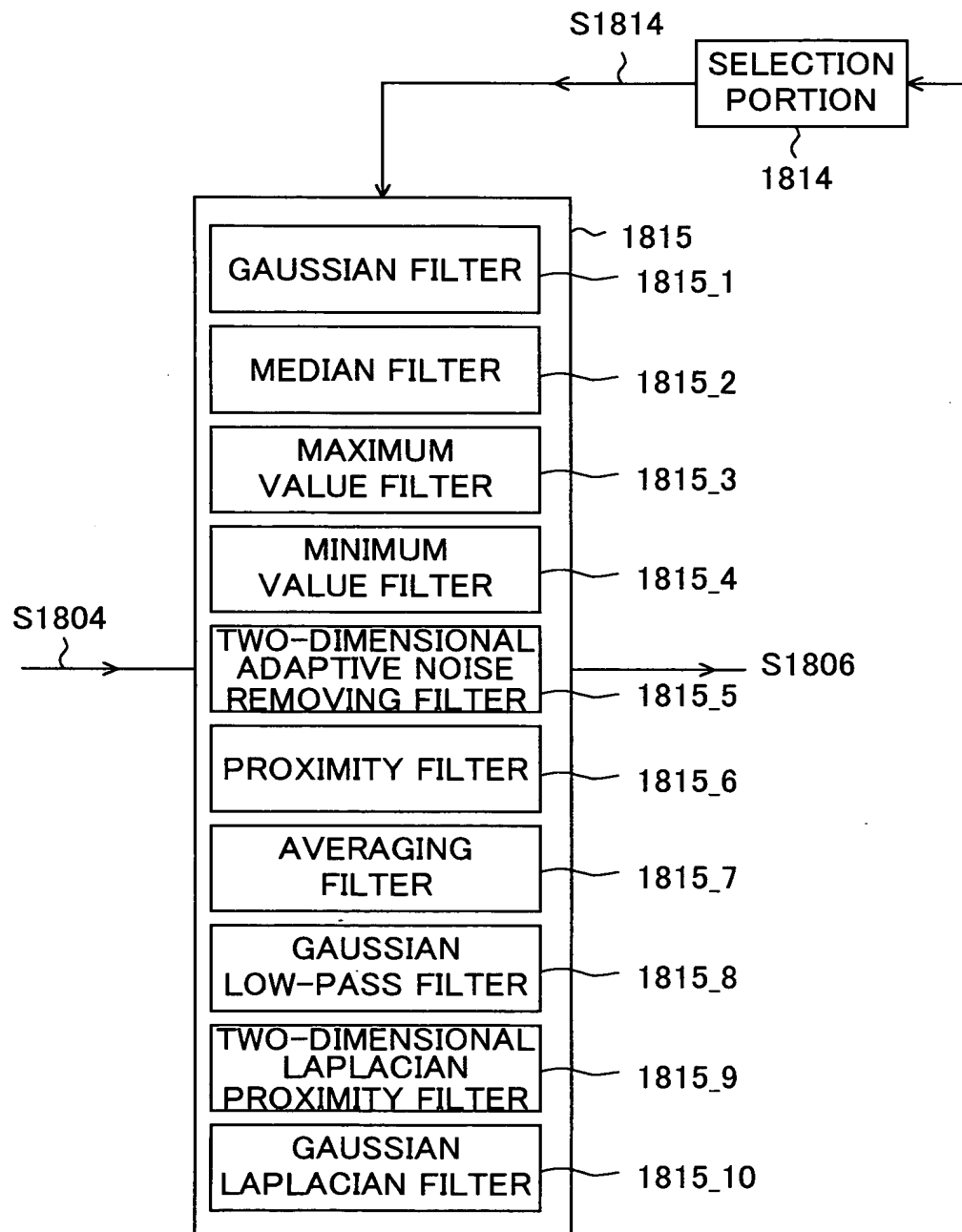


FIG. 8

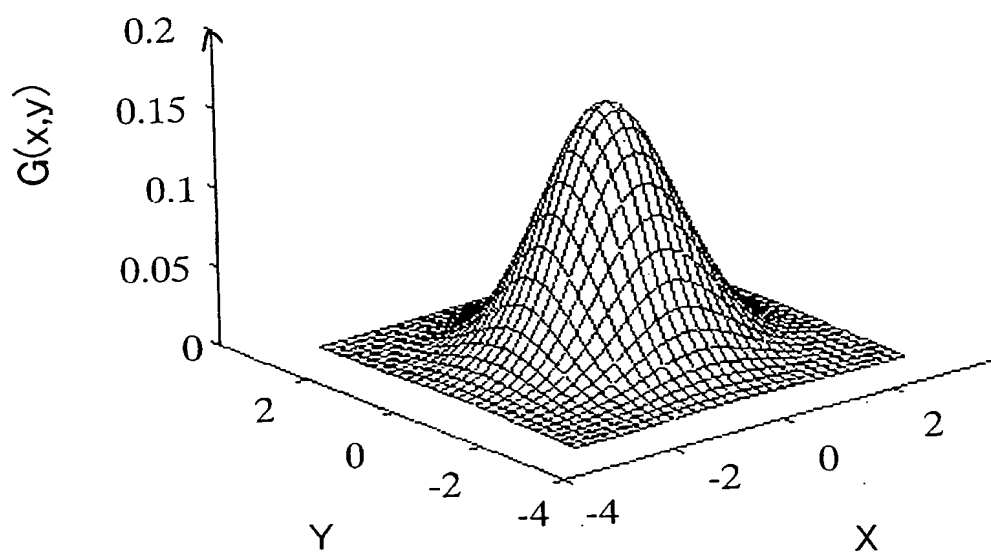




FIG. 9A

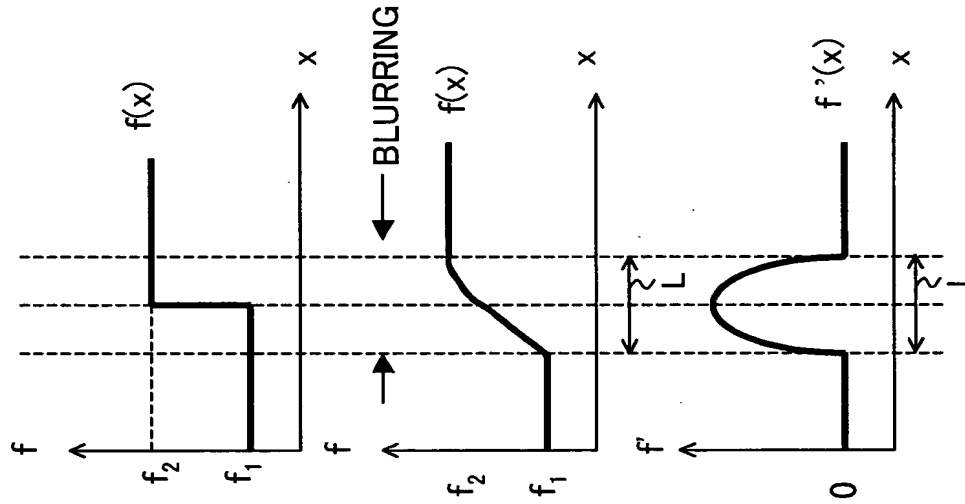


FIG. 9B

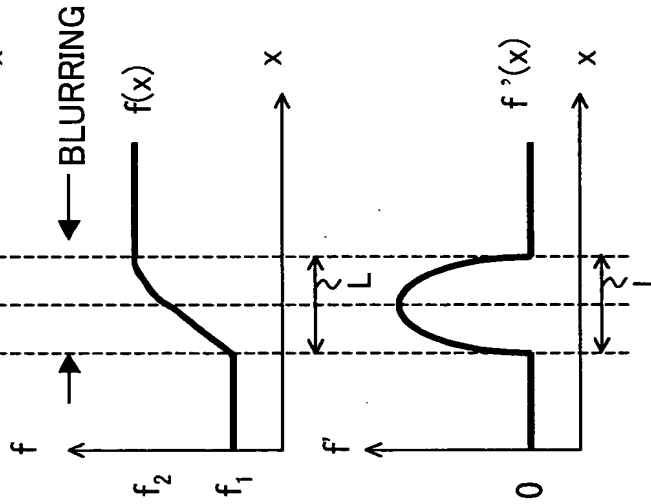
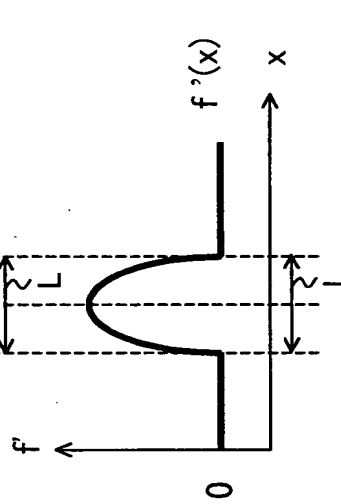


FIG. 9C



FIRST-ORDER DIFFERENTIAL

FIG. 9D

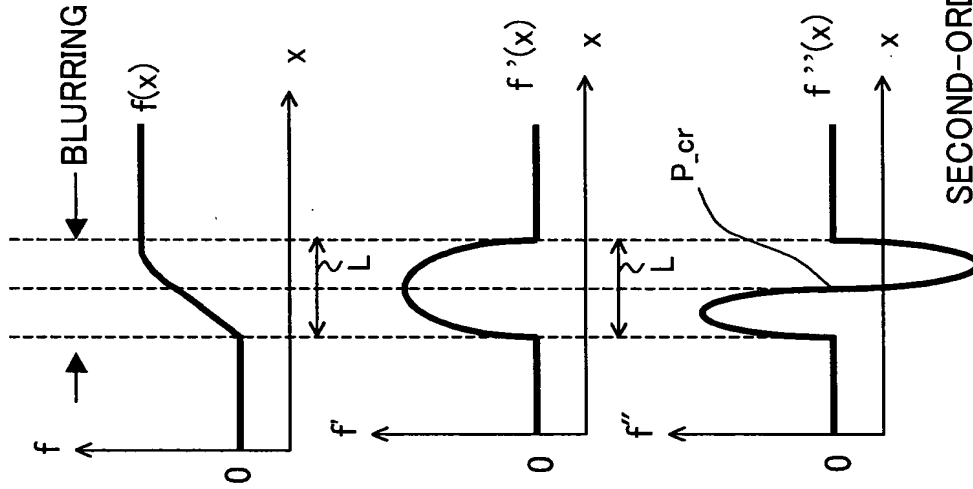


FIG. 9E

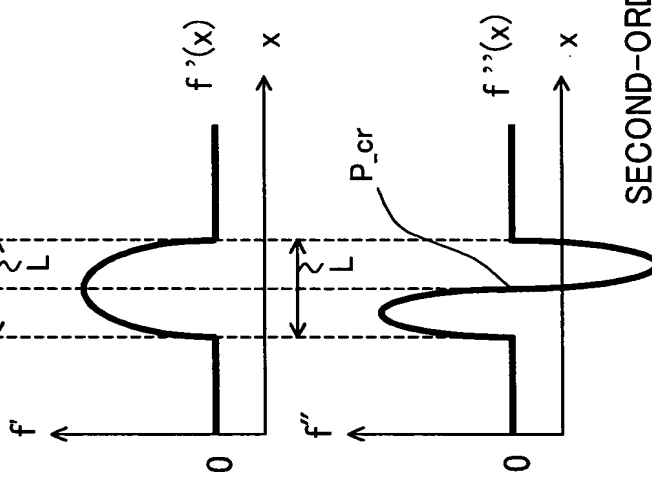
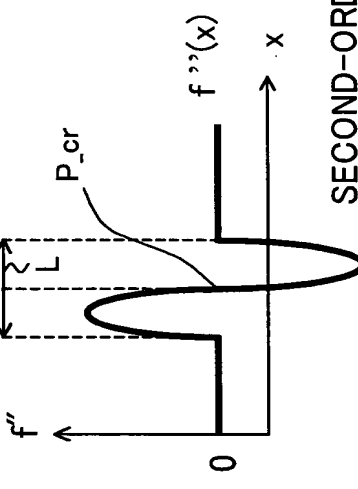


FIG. 9F



SECOND-ORDER DIFFERENTIAL

FIG. 10C

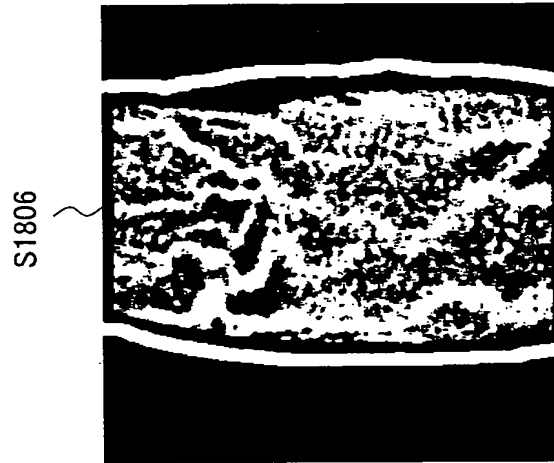


FIG. 10B

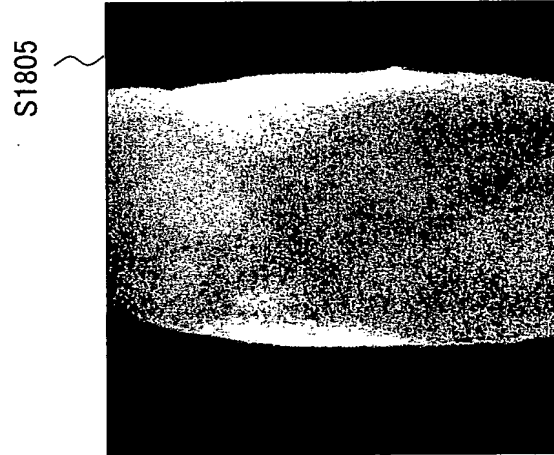


FIG. 10A

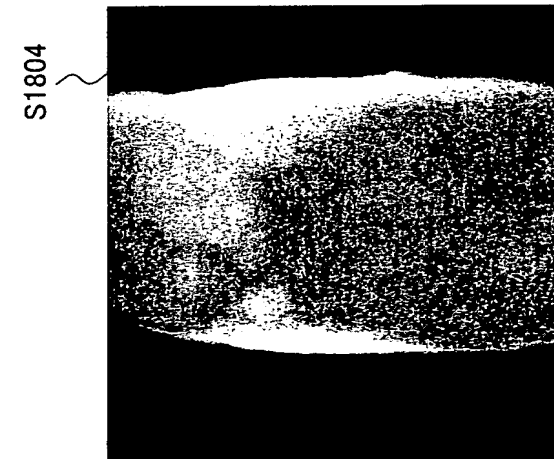


FIG. 11

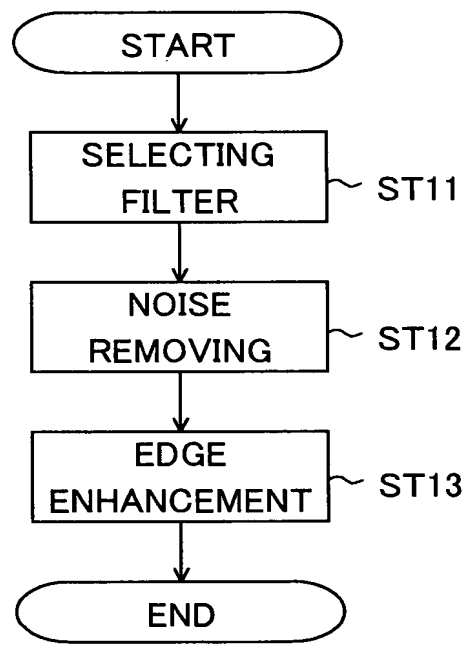


FIG. 12A

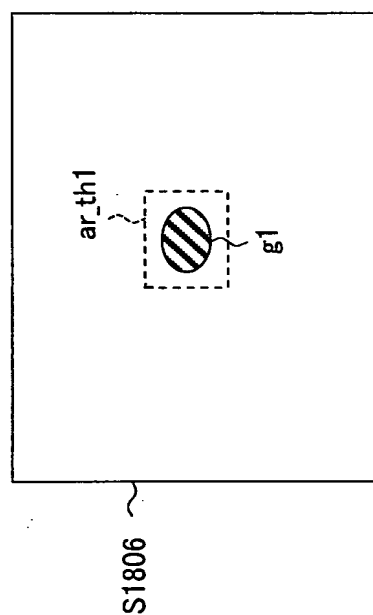


FIG. 12B

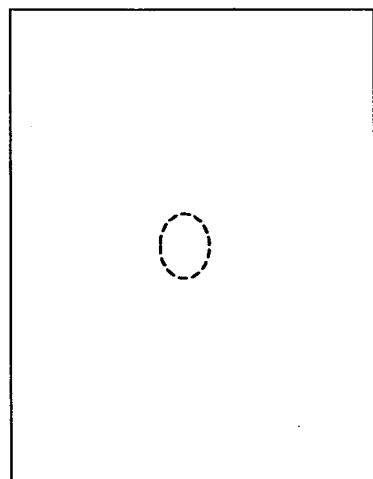


FIG. 12C

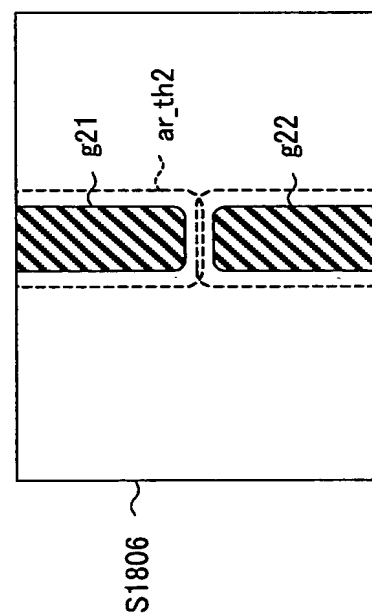
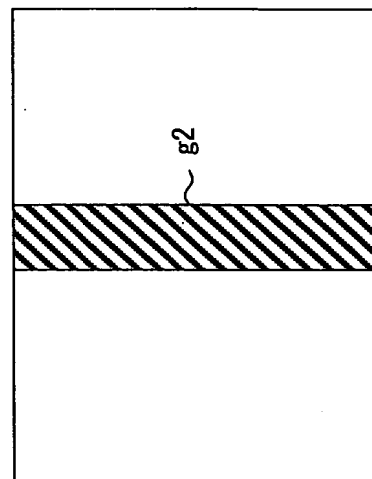


FIG. 12D



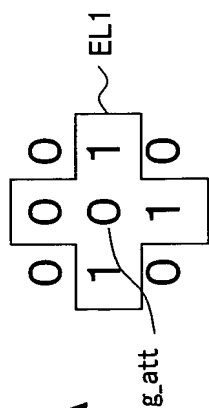


FIG. 13A

$\begin{matrix} & & & & g\_att \\ & & & & 0 \\ 0 & 0 & 0 & & \\ 1 & 0 & 1 & & \\ 0 & 1 & 0 & & g\_att \\ & & & & 0 \end{matrix}$

FIG. 13B

$\begin{matrix} & & & & g\_att \\ & & & & 0 \\ 0 & 0 & 0 & & \\ 0 & 0 & 1 & & \\ 1 & 1 & 1 & & g\_att \\ & & & & 0 \end{matrix}$

FIG. 13C

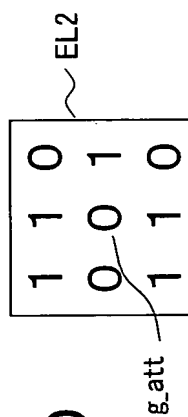


FIG. 13D

$\begin{matrix} & & & & g\_att \\ & & & & 0 \\ 1 & 1 & 0 & & \\ 0 & 1 & 1 & & \\ 1 & 1 & 0 & & g\_att \\ & & & & 0 \end{matrix}$

FIG. 13E

$\begin{matrix} & & & & g\_att \\ & & & & 0 \\ 1 & 1 & 0 & & \\ 1 & 1 & 0 & & \\ 0 & 1 & 1 & & g\_att \\ & & & & 0 \end{matrix}$

FIG. 13F

FIG. 14C

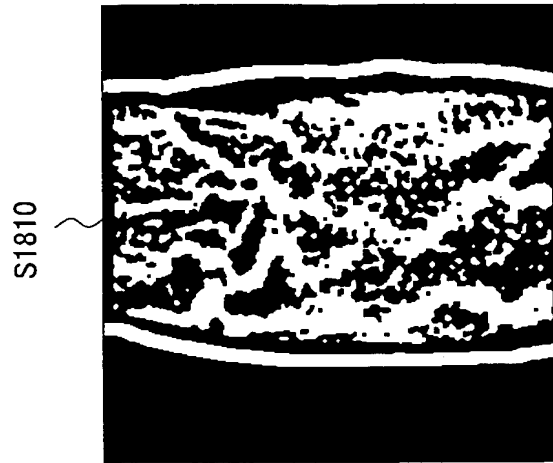


FIG. 14B

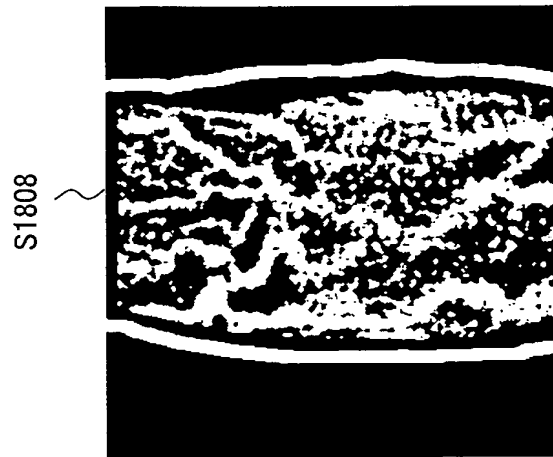
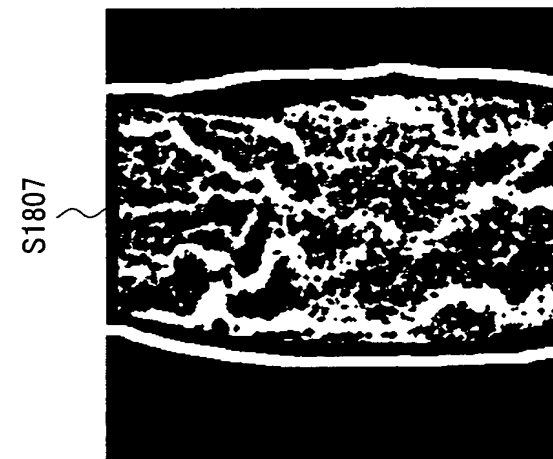


FIG. 14A



S1806

FIG. 15

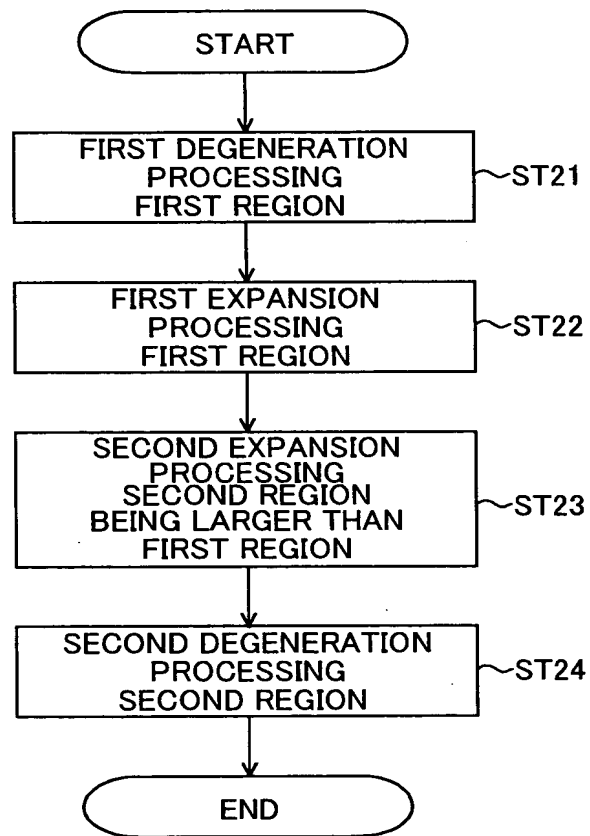


FIG. 16A

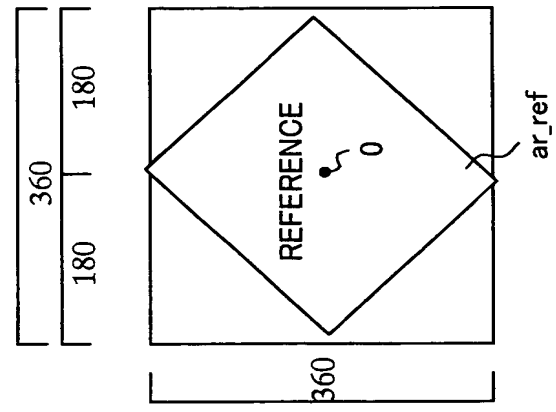


FIG. 16B

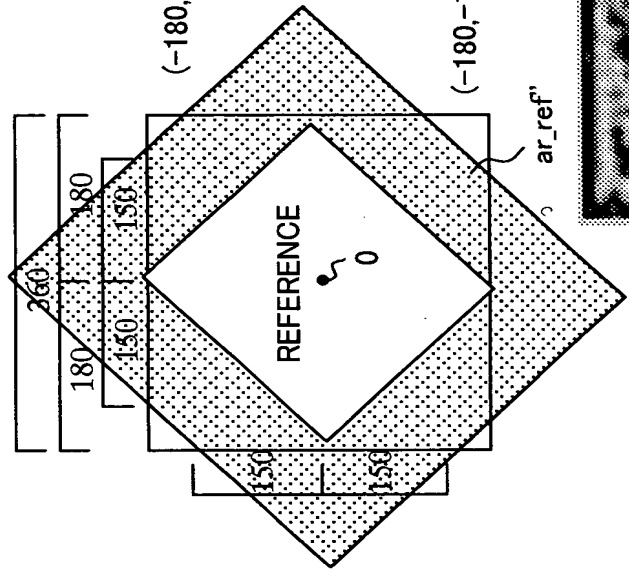
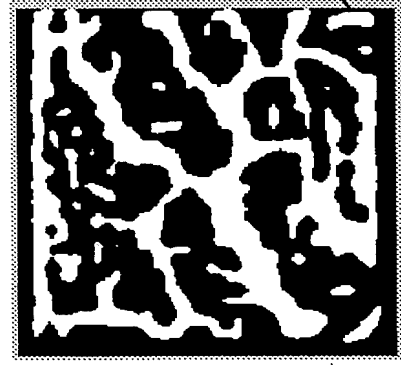
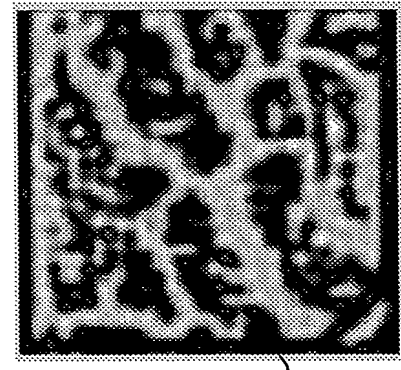
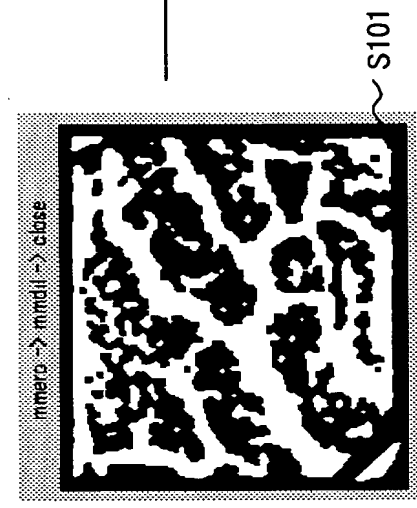
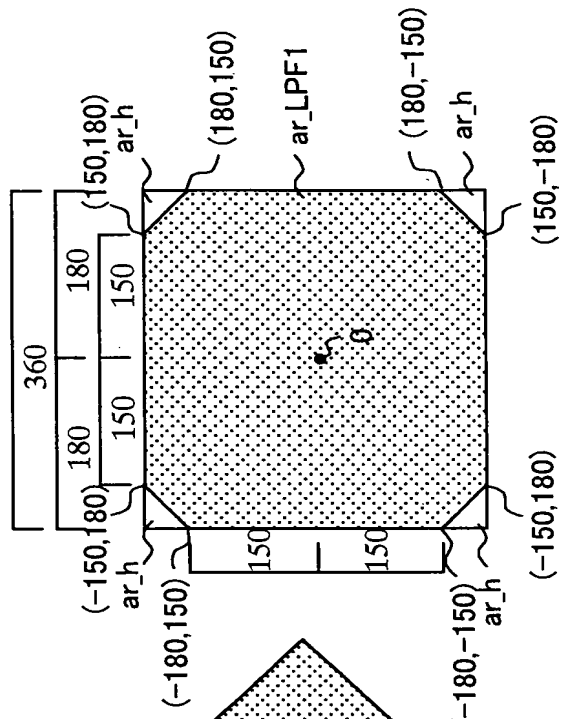


FIG. 16C



Th = 0.5

FIG. 16D

FIG. 16E

FIG. 16F



FIG. 17A

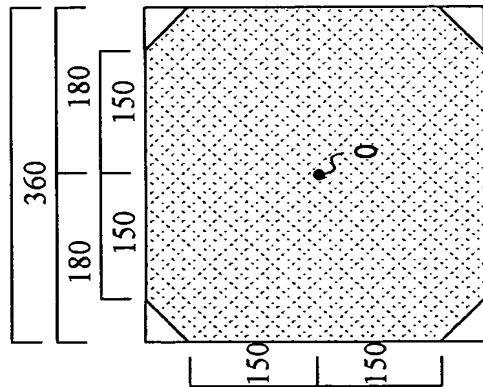


FIG. 17B

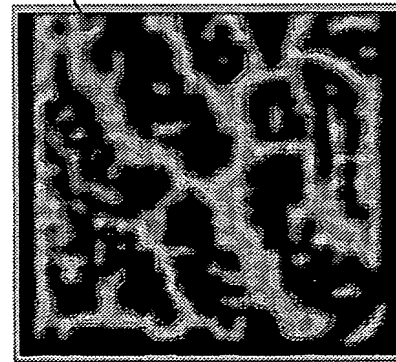
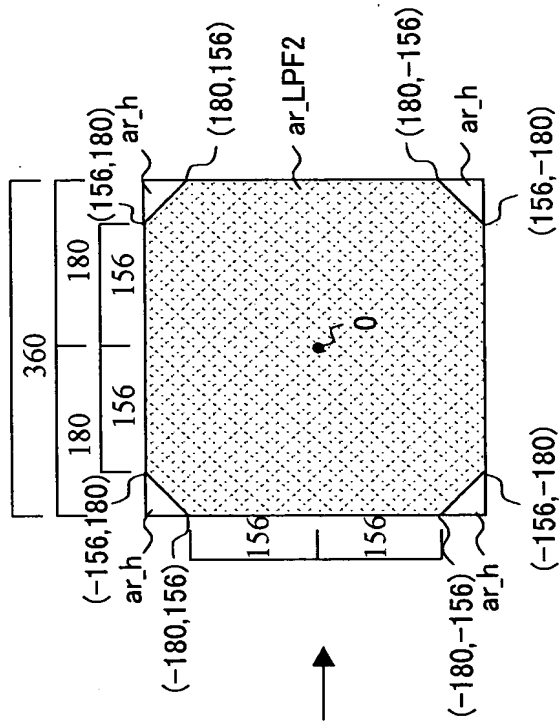


FIG. 17C

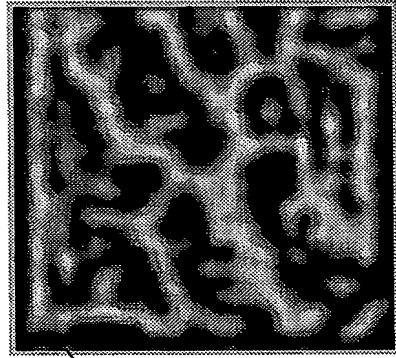


FIG. 17D

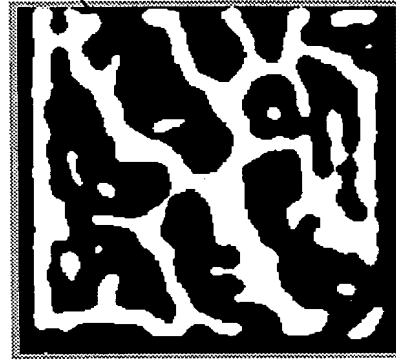


FIG. 17E

Th = 0.5

FIG. 18A

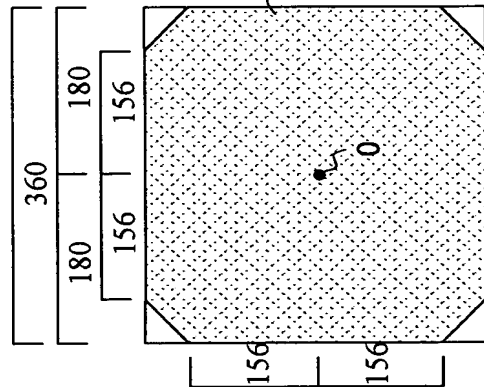


FIG. 18B

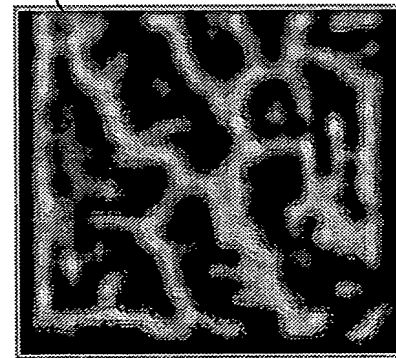
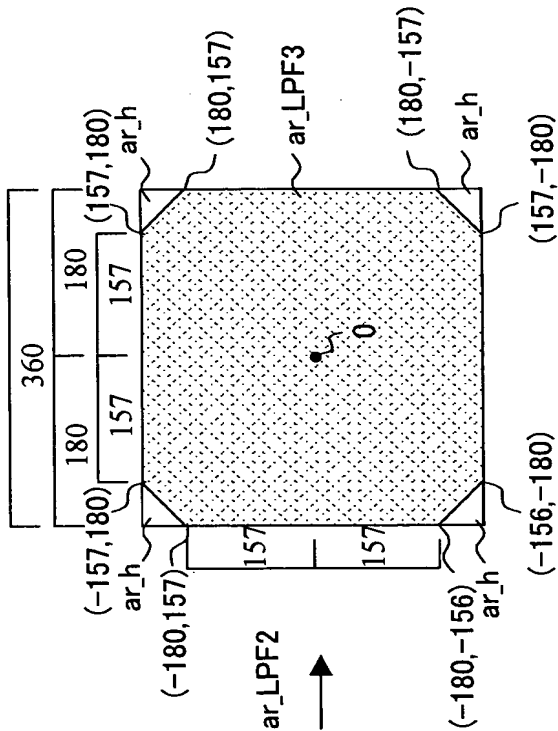


FIG. 18C

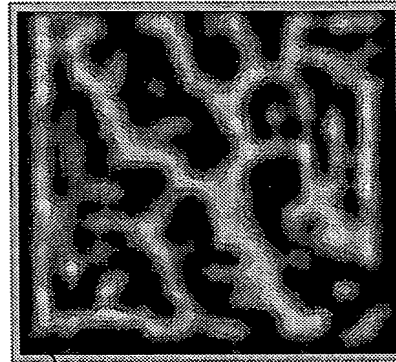


FIG. 18D

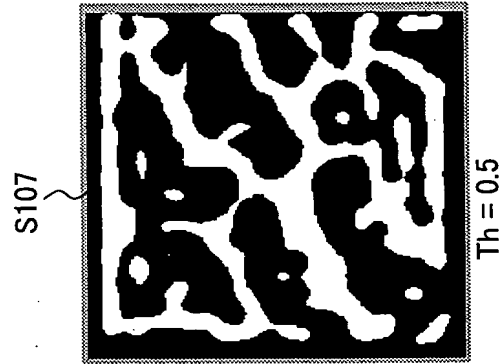


FIG. 18E

FIG. 19A

S1810

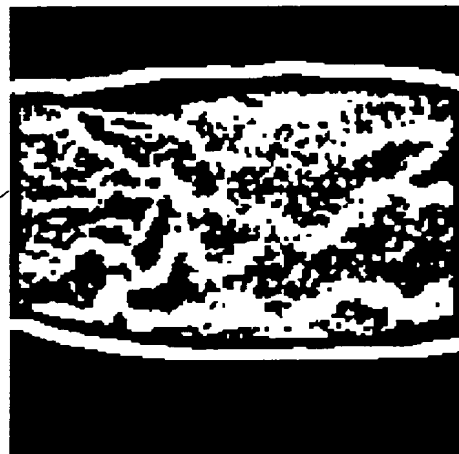


FIG. 19B

S18102

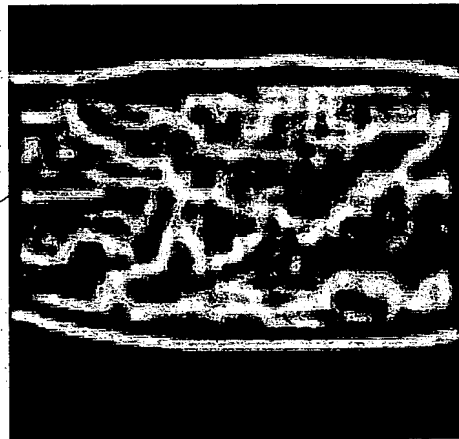
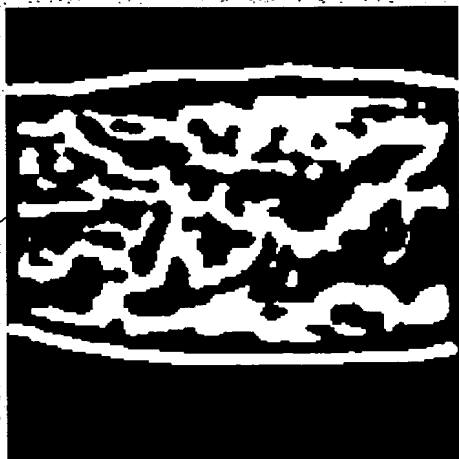
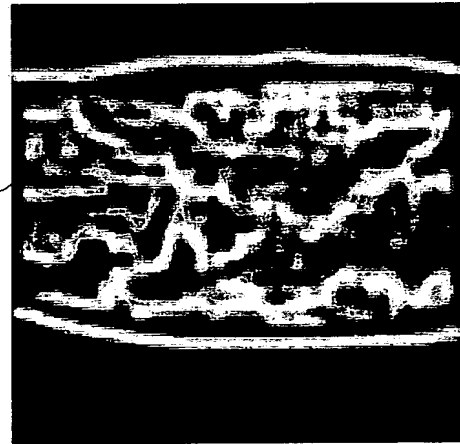


FIG. 19C

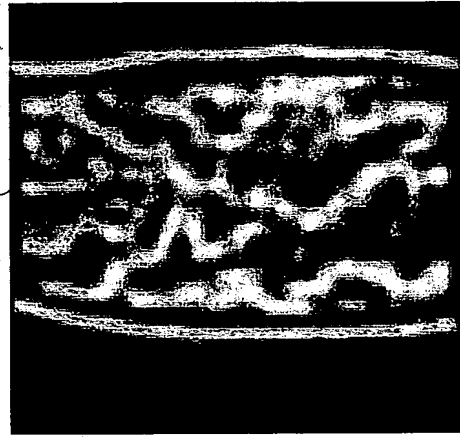
S18103



S18102



S18104



S18105

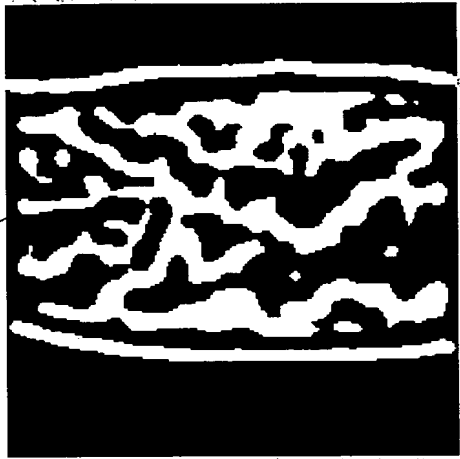


FIG. 19D

FIG. 19E

FIG. 19F

FIG. 20A

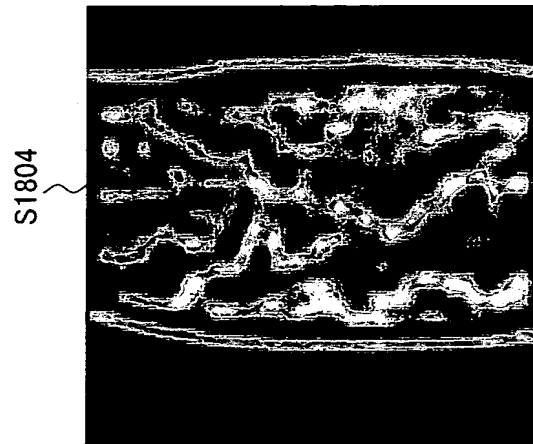


FIG. 20B

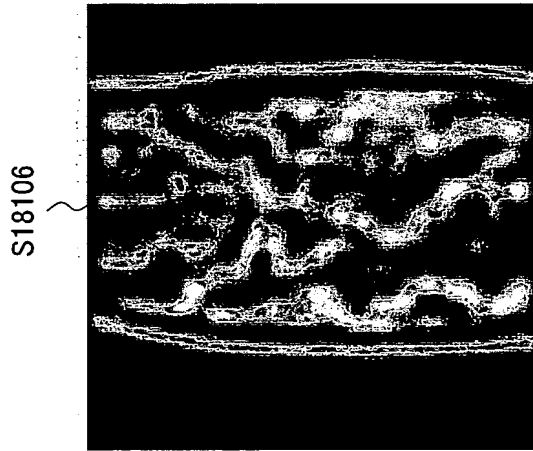


FIG. 20C

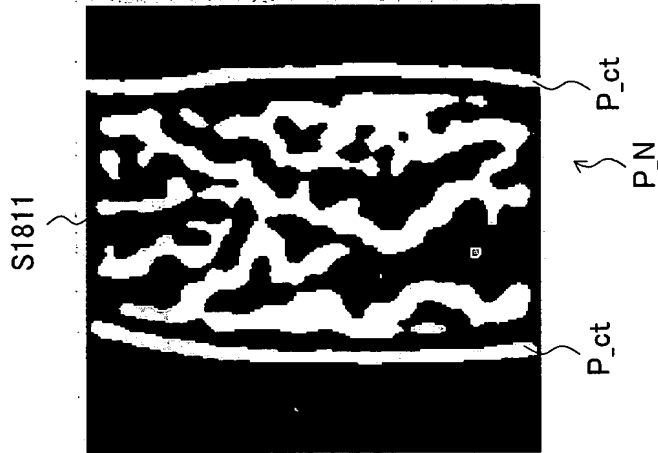


FIG. 21

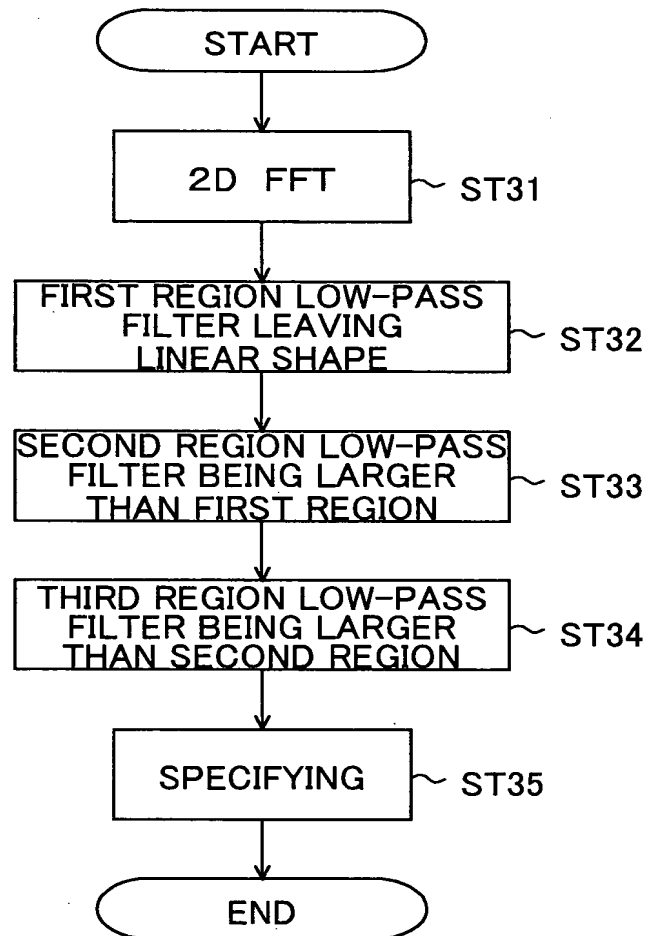


FIG. 22C

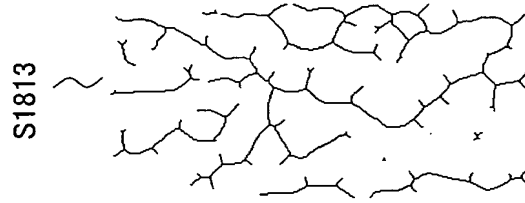


FIG. 22B

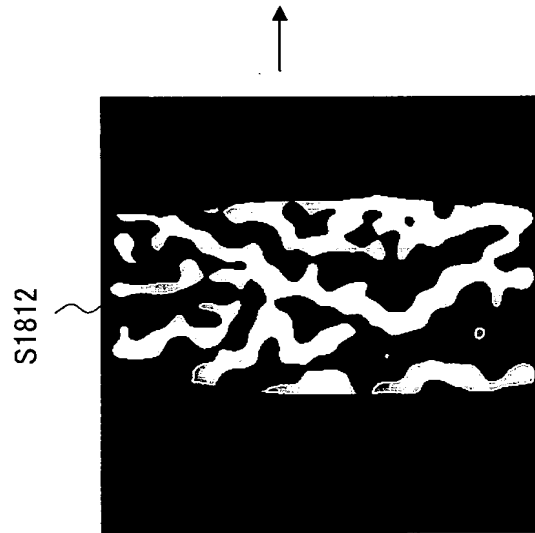


FIG. 22A

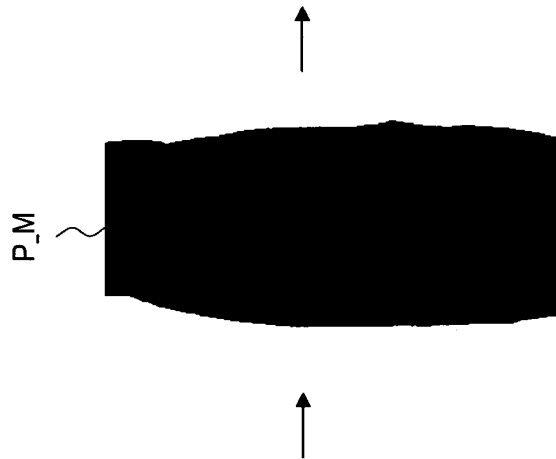


FIG. 23

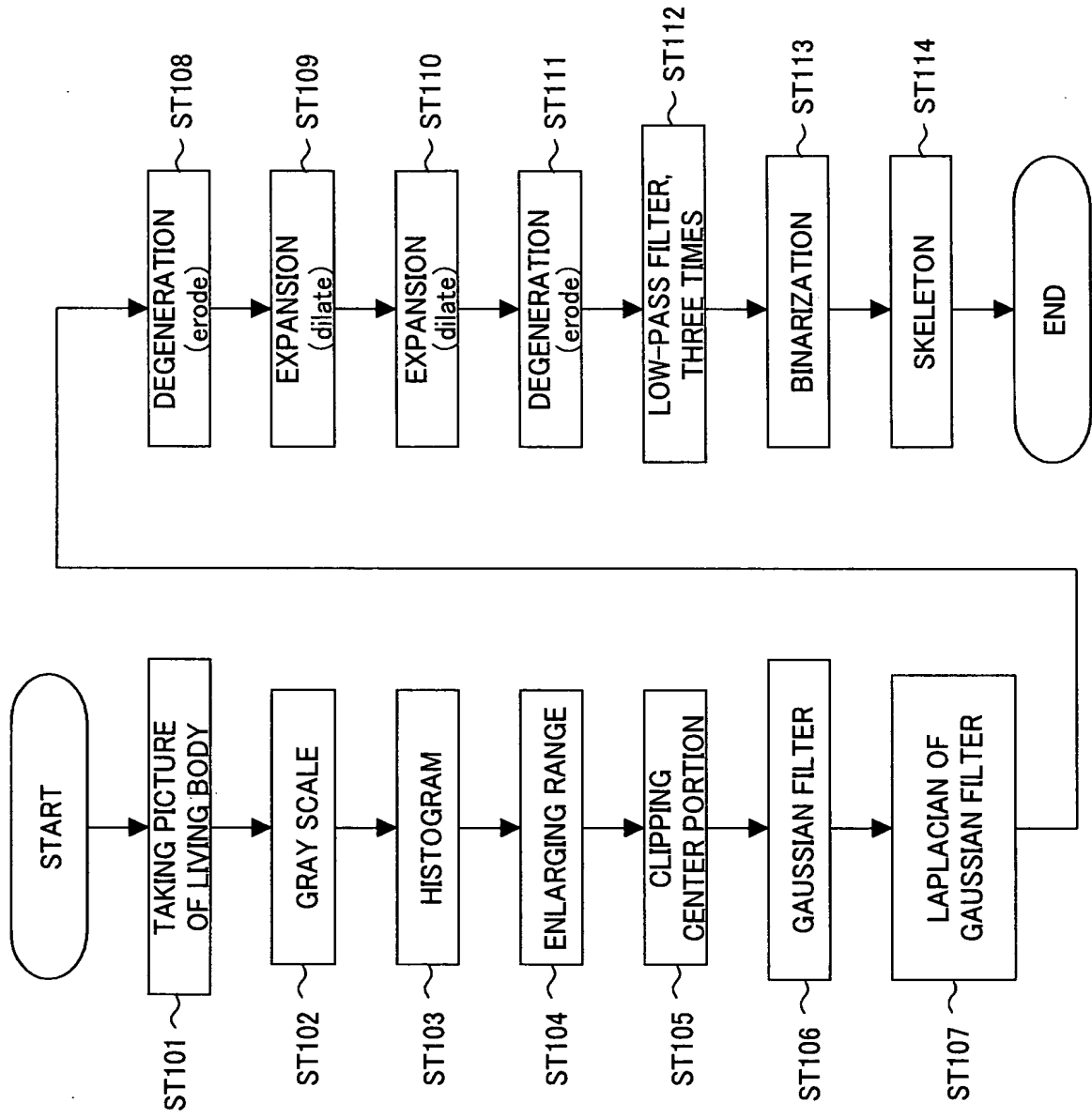


FIG. 24

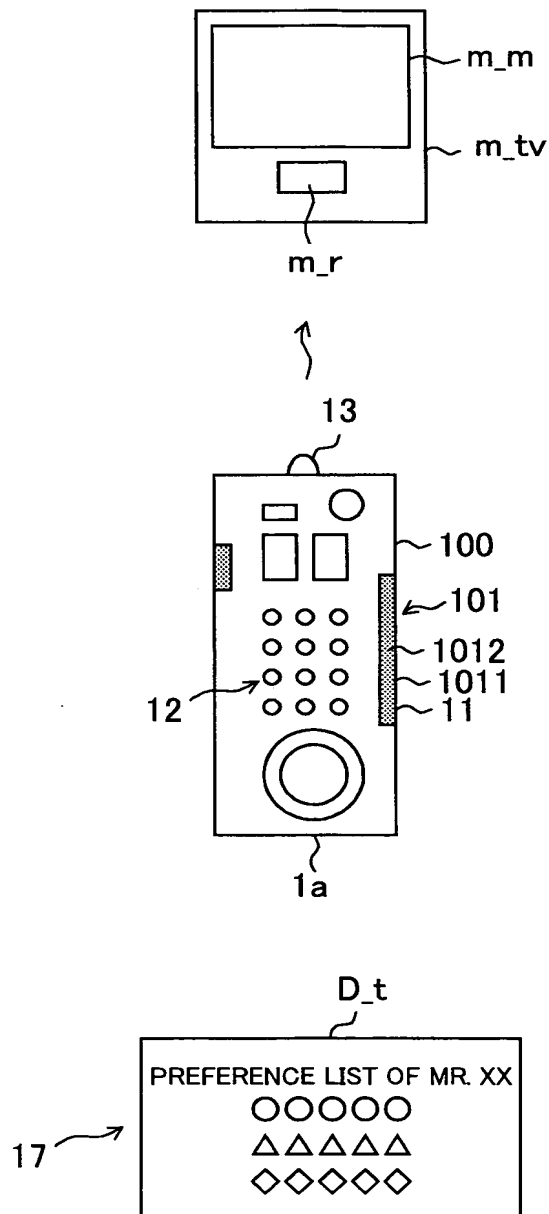




FIG. 25

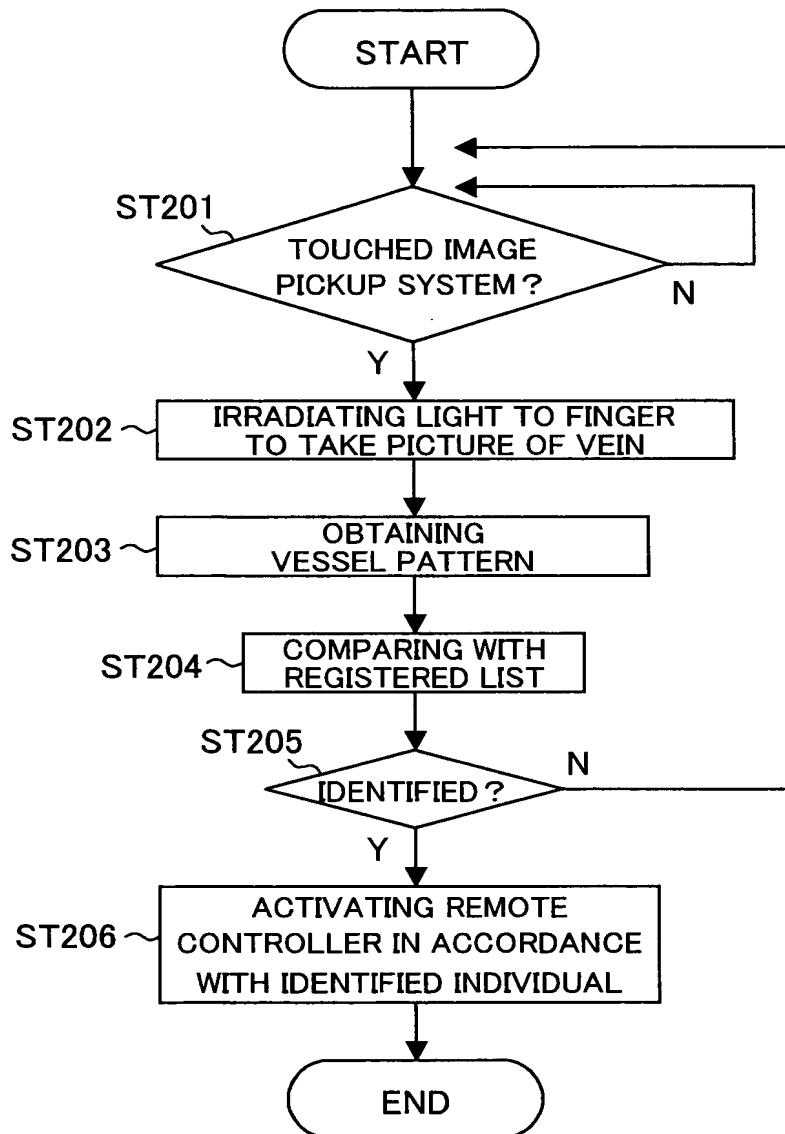


FIG. 26

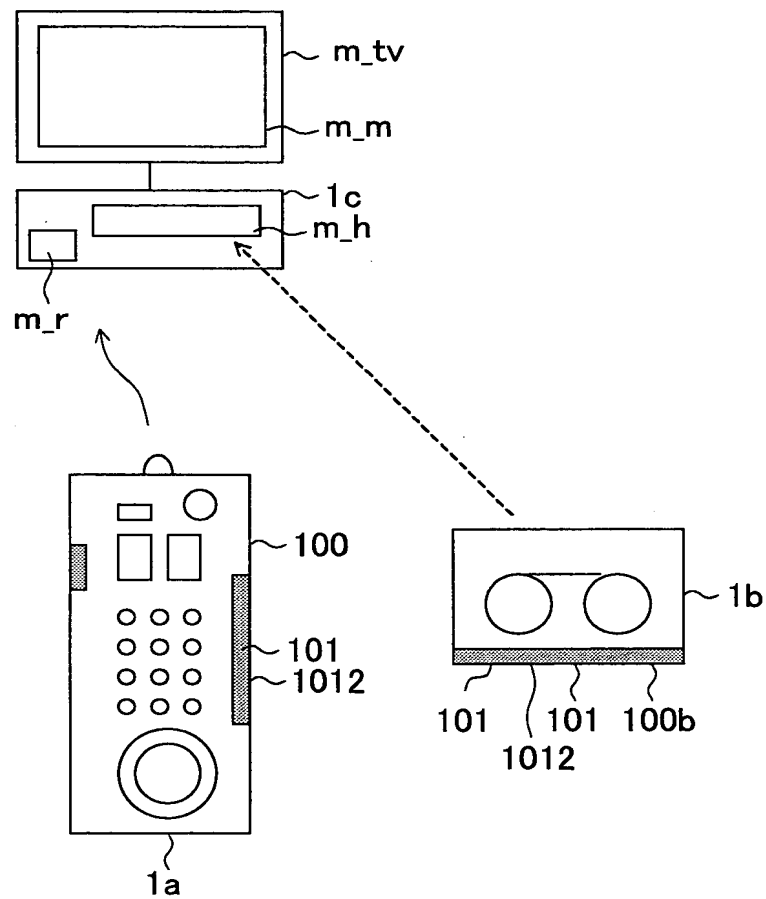
10b

FIG. 27

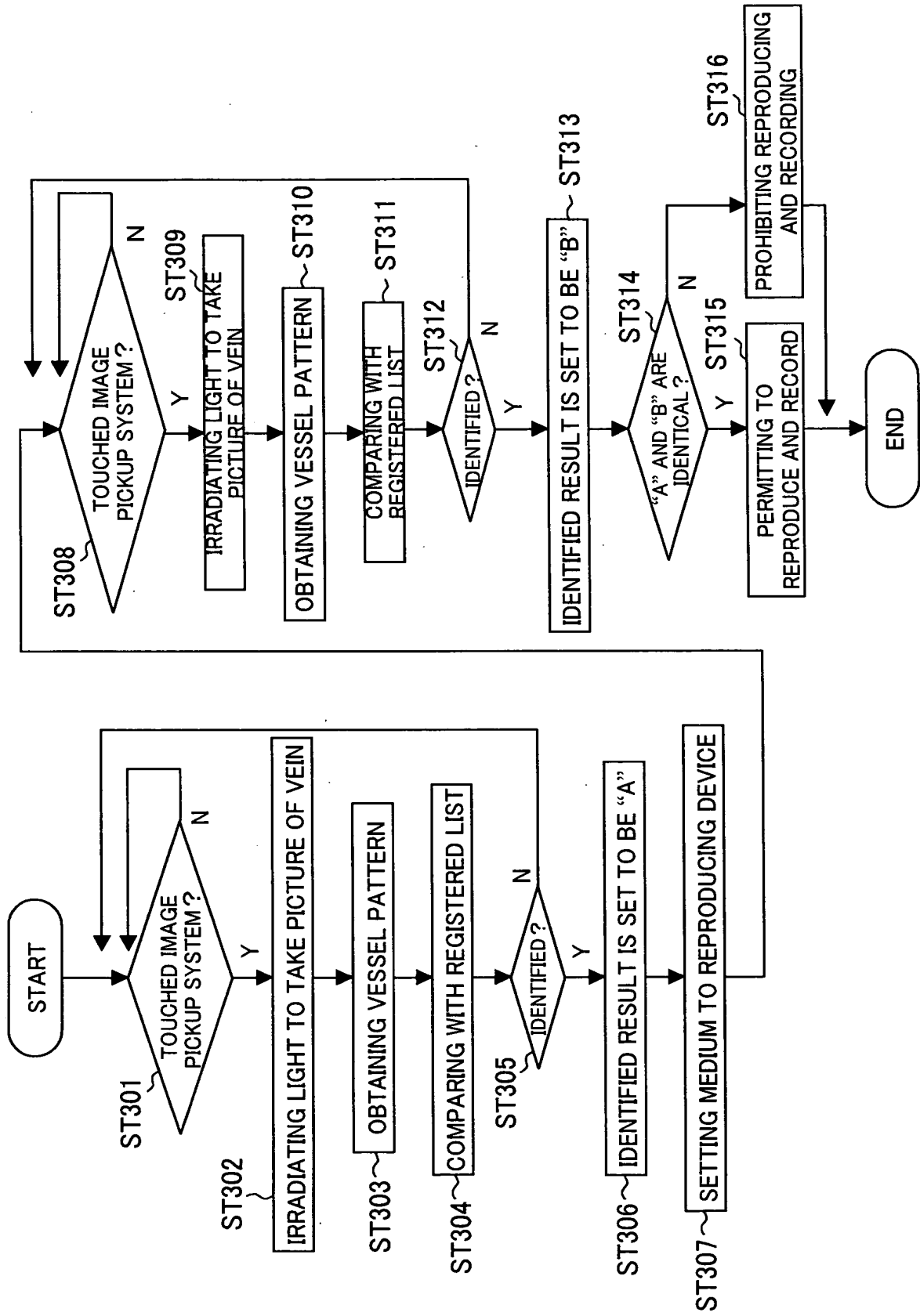


FIG. 28

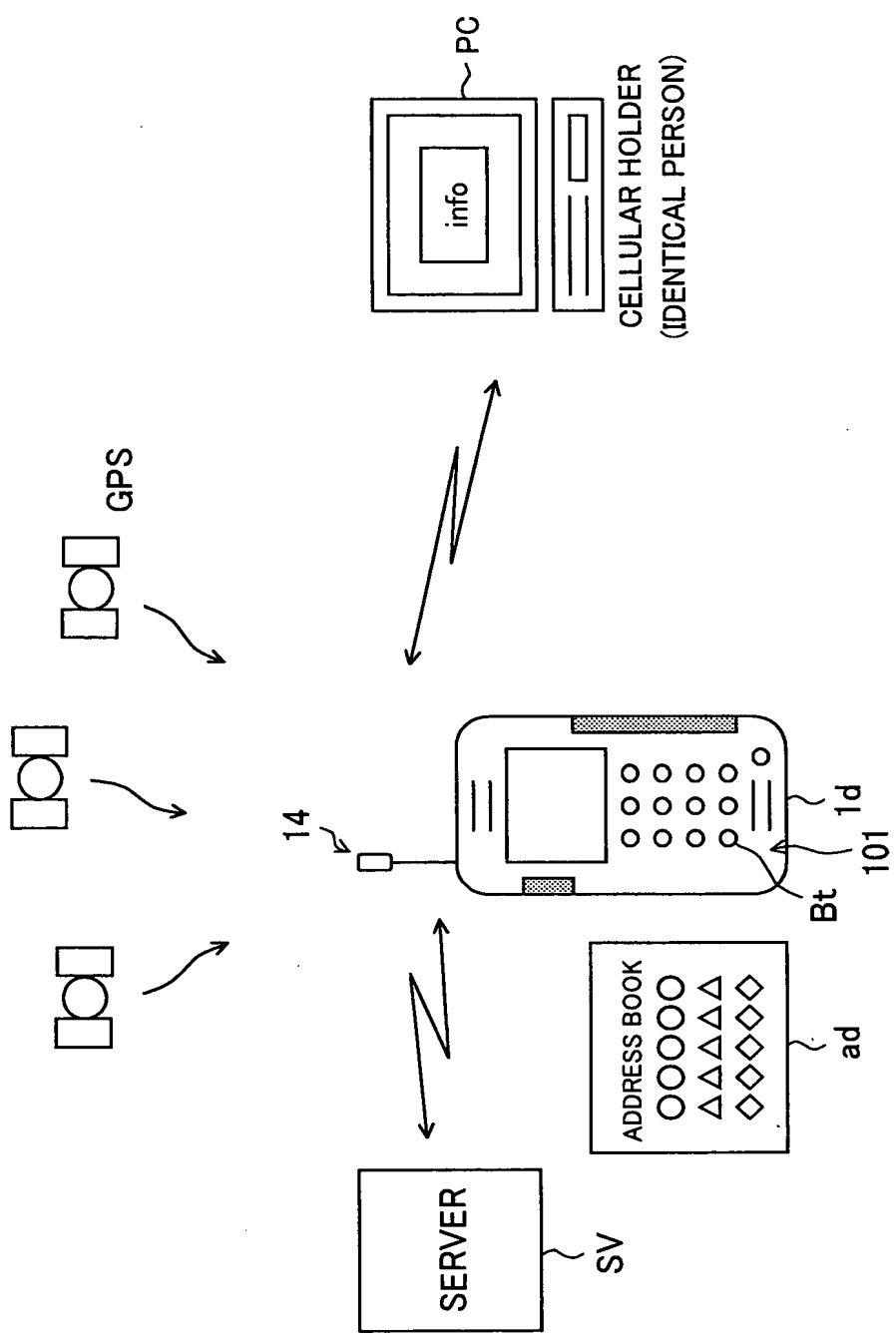


FIG. 29

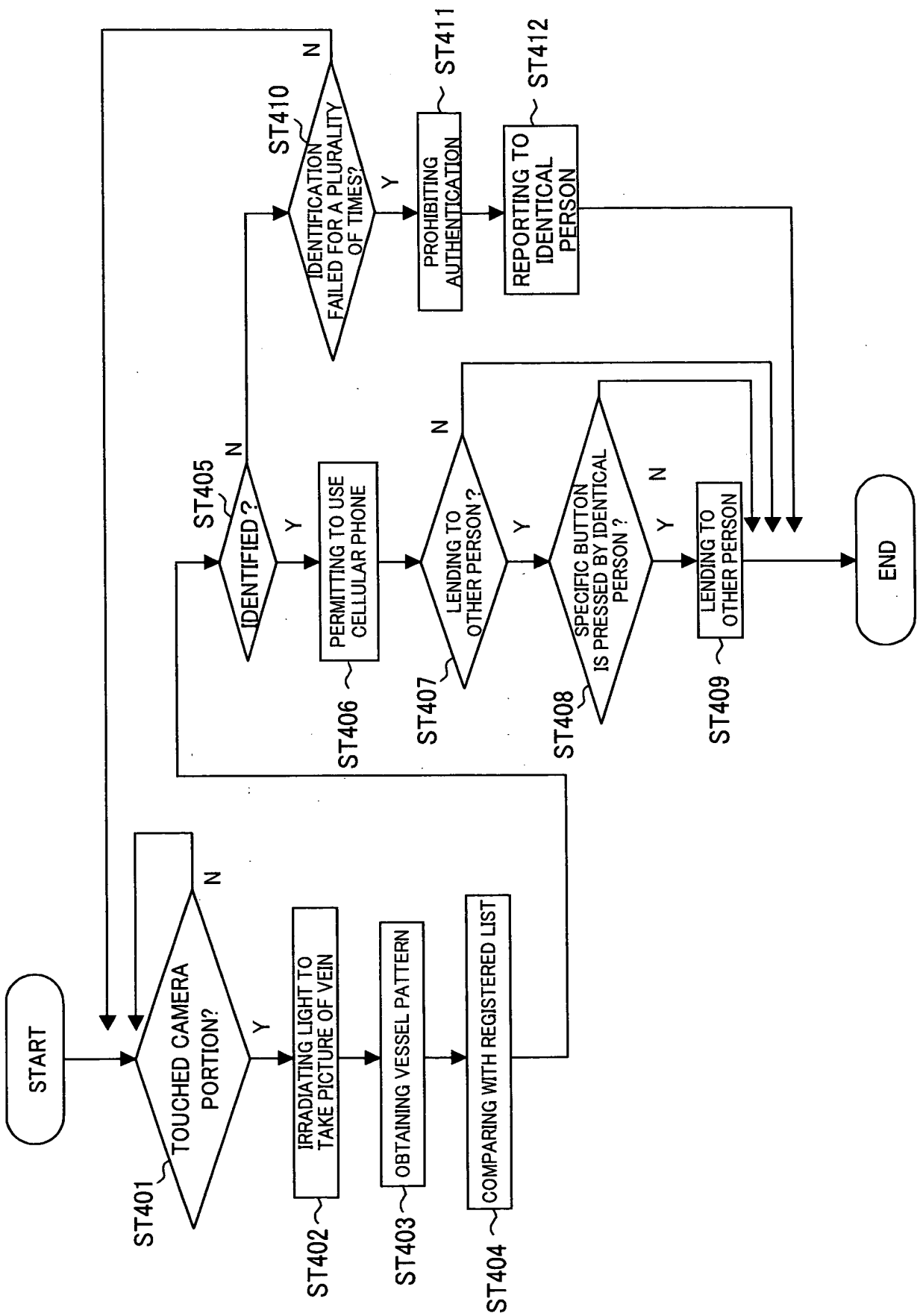


FIG. 30

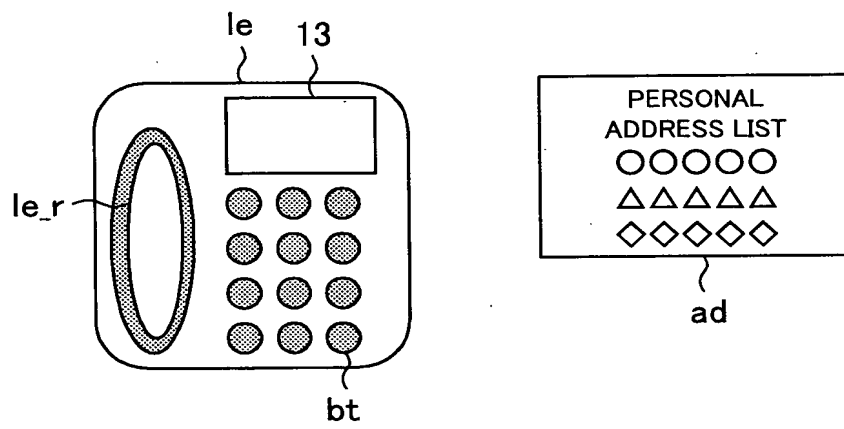


FIG. 31

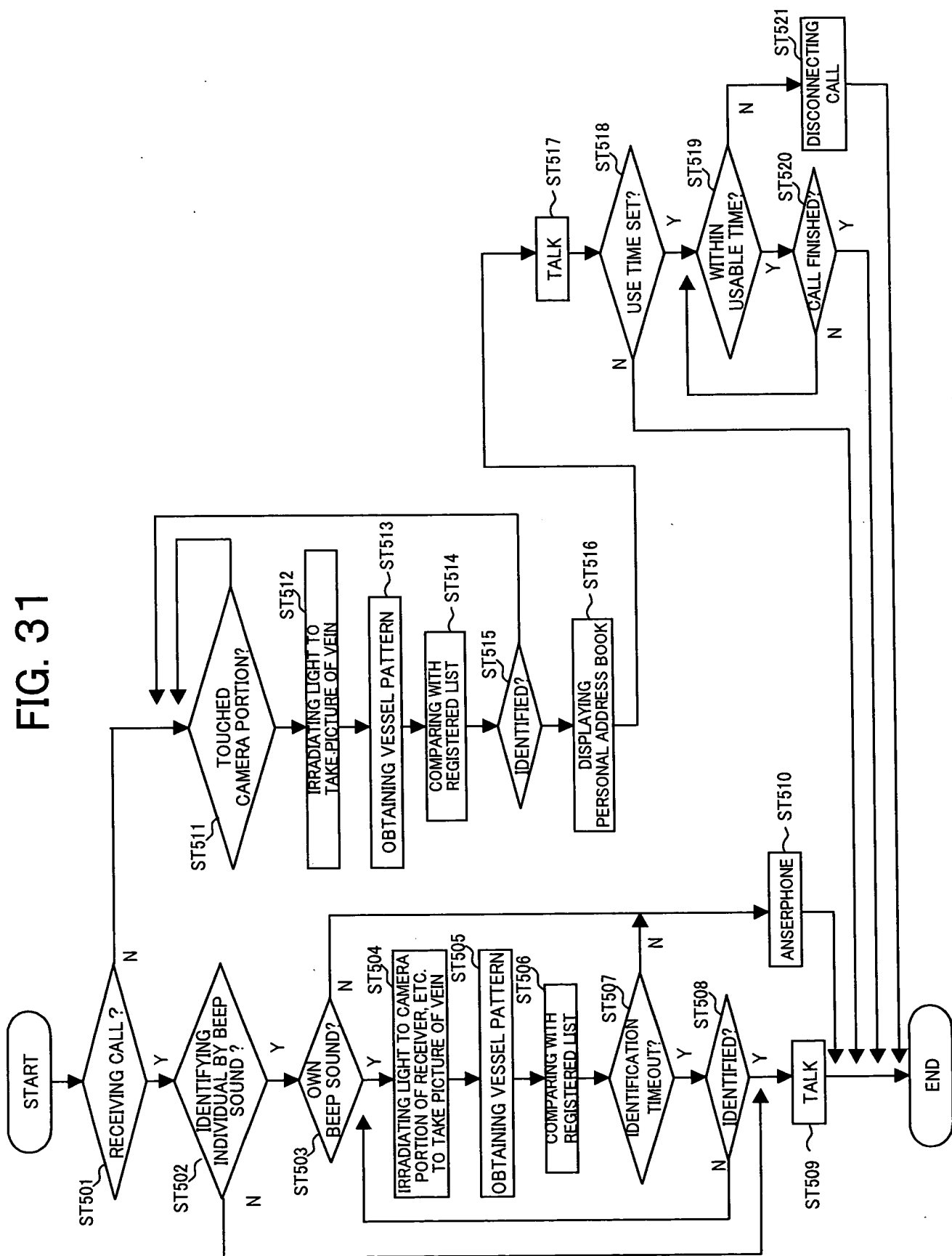


FIG. 32

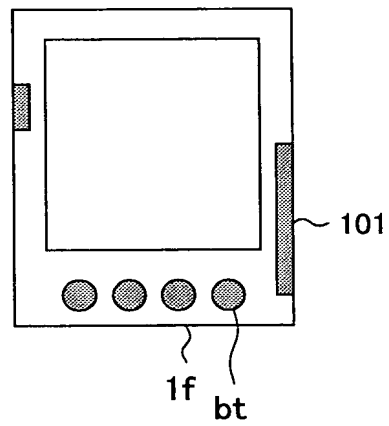
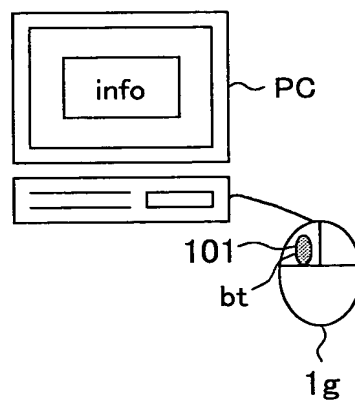


FIG. 33





## Explanation of References

- 1... data processing apparatus
- 2... image pickup unit
- 5 12... input unit
- 13... output unit
- 14... communication interface
- 15... RAM (random access memory)
- 16... ROM (read only memory)
- 10 17... memory unit
- 18... CPU
- 101... image pickup system
- 102... extracting unit
- 103... authentication unit
- 15 1011... irradiation portion
- 1012... optical lens
- 1801... gray scale conversion portion
- 1802... distribution data generation portion
- 1803... specifying portion
- 20 1804... mapping portion
- 1805... Gaussian filter
- 1806... Gaussian Laplacian
- 1807... first degeneration processing portion
- 1808... first expansion processing portion
- 25 1809... second expansion processing portion

- 1810... second degeneration processing portion
- 1811... low-pass filter portion
- 1812... mask portion
- 1813... skeleton portion
- 5 1814... selection portion
- 1815... noise removing filter
- 1815\_1... Gaussian filter
- 1815\_2... median filter
- 1815\_3... maximum value filter
- 10 1815\_4... minimum value filter
- 1815\_5... two-dimensional adaptive noise removing filter
- 1815\_6... proximity filter
- 1815\_7... averaging filter
- 1815\_8... Gaussian low-pass filter
- 15 1815\_9... two-dimensional Laplacian proximity filter
- 1815\_10... Ga